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Notes on the American Species of *Tolypella*.

By T. F. ALLEN.

(Plates XXXVII.—XLII.)

In this paper some new species of the genus *Tolypella* will be described and an account given of those already known to inhabit America, which promises to yield an unusual number of these interesting plants.

The two families into which the Characeæ may be divided are characterized mainly by the structure of the coronula of the sporangium, this being formed by a division of the cells, which, like spiral tubes, envelop the nucleus. In the *Characeæ* a *single* septum in each tube, near its extremity, gives rise to a circle of *five* cells on the top of the sporangium. In the *Nitelleæ* two septa form, and a double series, of five cells each, produces a coronula of *ten* cells; this, in some species, is detached as the fruit matures (not increasing in size, *pari passu*, with the enveloping cells) and is *evanescent*, while in others it is *persistent*. The *Nitelleæ* consist of two genera mainly differentiated by the position of the *antheridium*, which in *Nitella* is *apical*, on the primary ray of the leaf, while the sporangia are lateral on the node below the antheridium. The leaves also possess but one leaf-bearing node, though they may divide repeatedly. In *Tolypella* (A.Br.) Leonh., the leaves have 1–3 nodes, bearing leaflets and many-celled terminals; the leaflets do not equal in size the primary ray, are many-celled and often themselves have nodes which bear leaflets. *Antheridia* are one or several, *lateral on the nodes of the leaf and leaflet*, and also at the fundus of the verticil within the leaves (when, like the sporangia, they seem to arise from the cells surrounding the base of the leaf [the basilar node] T. F. A.), mostly with an elongated stipe.* In most species, the leaf-node seems to possess six principal nodal cells which encircle the leaf, three of these giving rise to fruit, and three to leaflets. Sometimes we find four fruiting cells and two leaflets, and sometimes the reverse. In a few instances the nodal cells are sub-divided, and an increased number of fruits and leaves is found. This is now and then observed in *T. intertexta* in the sub-division of a nodal cell, so that double sporangia are produced, one above the other. At first sight this looks like a circle of four sporangia with a central antheridium. The fruiting cells are always on the ventral (looking inward toward the axis of the plant) aspect of leaf, and the leaflets are always dorsal. The antheridium seems to occupy

* Prof. Braun says: "Sporangia *surrounding* the antheridium in large numbers on the nodes of the leaf" etc. Numerous preparations of fresh specimens with careful staining of the protoplasm, and good sections of the nodes, have failed to show, in any American species, that the sporangia arise from cells "*surrounding*" the base of the antheridium.

the first or central, the sporangia the lateral cells. This rule seems also to be observed in the fundus of the verticil, in which we find the antheridium on the inner aspect of the basal node, while the sporangia are lateral or even external, and, in other cases, these basal cells produce adventitious leaflets instead of sporangia, carrying out the same plan found on the leaf-node. The coronula is persistent or evanescent.* The leaves which bear fruit become compacted into more or less dense heads (or "nests"), owing, apparently, to a diminished growth of stem and leaf; the verticils are approximate, often closely so, and the leaves are incurved, forming a tangled mass.

The following key has been arranged to include the species known at this time.

KEY TO THE SPECIES OF TOLYPELLA.

- I. OBTUSIFOLIA.—*Coronula evanescent*. Sterile leaves undivided.
- A. Ultimate cell of the primary ray of the leaf longer than the other cells. *T. longicoma*, A.Br.
 - B. Ultimate cell not longer.
 - † Leaflets attenuate.
 2. Marine. Nucleus $370-500\mu$ long. *T. nidifica*, Leonh. (Europe.)
 3. Submarine. Nucleus $300-340\mu$ long. *T. Normaniana*, Ndst. (Europe.)
 - † Leaflets not attenuate.
 4. Saline. Nucleus $300-360\mu$ long. *T. glomerata*, Leonh.
 5. Fresh water. Nucleus $425-475\mu$ long, maturing in fall. *T. comosa*, Allen.
- II. ACUTIFOLIA.—*Coronula persistent*.†
- A. *Indivisa*. Sterile leaves undivided.
 6. Nucleus $350-375\mu$ long, leiopyrena. *T. prolifera*, Leonh.
 7. Nucleus $425-450\mu$ long, oxygyra. *T. fimbriata*, Allen.
 - B. *Divisa*. Sterile leaves divided (usually into four terminal leaflets.)
 - † *Attenuata*. Leaflets attenuate.
 - § Secondary ray undivided, sterile.
 8. Nucleus $285-355\mu$, rays 4-7-celled. *T. Californica*, A.Br.
 9. Nucleus $330-340\mu$, rays 3-4-celled. *T. stipitata*, Allen.
 - §§ Secondary rays divided, fertile.
 10. Nucleus $360-425\mu$ long. *T. intricata*, Leonh.
 11. Nucleus $450-500\mu$ long. *T. intertexta*, Allen.
 - †† *Non attenuata*.
 12. Ultimate cell mucroniform; nucleus $480-500\mu$. *T. apiculata*, A.Br. (S.Am.)

T. longicoma, A.Br. (MS., 1855).—The following account of this species is taken from "Braun's Fragmente, by Nordstedt."

"*T. longicoma* is related to *T. nidifica* and *glomerata* from which it

* It seems persistent in all the species having acute leaves and evanescent in all the species with obtuse ones.

† In number 11 the coronula is *sub-persistent* only.

differs in its compact, tufted growth, thin, delicate stem and leaves, want of all incrustation and flexibility. The sterile leaves are simple and very long, the ultimate segment (in the fertile leaves likewise) *always elongated*, but little attenuated. The fertile heads are small, compact, long tufted. The first segment of the fertile leaf is extremely short, and here only are very short lateral rays, *which are quite wanting on the the innermost, smallest fertile verticils*, or are so dwarfed as to be indistinguishable. Since the delicate cell-membrane tears easily on preparing the plant, it is difficult to spread it out and examine it. It forms dark green, thick tufts a hand high. Stem not over 480μ thick; leaves in the sterile verticil 6, simple, apparently 3-celled, and about 40^{mm} long. I saw, however, only two cells, often only one. The first cell is $20\text{--}25^{\text{mm}}$ long, $30\text{--}38\mu$ thick, also the second cell seemed very long and but little attenuated. Fertile verticils bunched; bunches complicated by axillary shoots; the first segment of the fertile leaf is very short, bearing seeds and some (2) small, 3-celled, lateral leaflets (rays); the terminal leaflet larger, 3-celled, *the middle or even the lowest cell the longest*. (Italics mine. T. F. A.) Terminal cell always long, curved, attenuated, rounded at the point. The innermost fertile leaves are very short and apparently (to me) without lateral leaflets, only with seeds on the first node, and monœcious, though I saw the antheridia fallen from the plant only. Sporangia with a short, blunt, rounded coronula, often with the base of the latter much swollen, several together, seldom with short stipes. Nucleus *brown*, with 9 striæ and slight angles. Sporangia $580\text{--}600\mu$ long, $420\text{--}430\mu$ broad, nucleus $360\text{--}400\mu$ long, $300\text{--}320\mu$ broad; antheridia 360μ in diameter.

"Swamps near Columbus, Ohio (com. Lesquereux, 1855). The specimens are mixed with another species, apparently *N. flexilis*."

I have been unable to obtain specimens of this species, nor does Professor Lesquereux know the locality in which it was collected. I await its rediscovery.

Tolypella glomerata, Leonh.,—This is characterized as follows, by A. Braun in his Characeæ of Africa:

"Statura mediocris, color incrustatione glaucus vel cinerascens. Folia verticillorum sterilium indivisa, fertilia capitulorum (et nonnunquam transitoria) simpliciter divisa, radiis 3-4- cellularibus parum attenuatis obtusis. Sporangia in divisura foliorum et in fundo verticilli aggregata, nucleo ovali, $0.30\text{--}0.36^{\text{mm}}$ longo, fusco, 8-9-gyrato."

Var. ABBREVIATA, *nov. var.*, differs as follows:

Statura variabilis, color incrustatione cinerascens vel munda. Folia et sterilia et fertilia *abbreviata*, radiis 3-cellularibus vix attenuatis obtusis. Sporangia aggregata, coronula evanescente, nucleo fusco $300\text{--}335\mu$ longo, striis 6-8, acutis vix prominulis. Antheridia longe stipitata $230\text{--}380\mu$ diam.

I have thus far discovered two forms: one, *forma incrustata*, large, to 0.15^{mm} high, densely incrustated, with smaller antheridia (230μ in diam.) and larger nuclei (335μ long), striæ 7 to 8. Collected by Mr. Pringle in alkaline pools in Arizona, April, 1881, and again in 1882. The other, *forma pygmæa munda*, small, $0.02\text{--}0.03^{\text{mm}}$ high, without the slightest incrustation, with very short leaves (as above), larger anther-

idia (380μ in diam.) and smaller nuclei (300μ long) with only six striæ, collected by Prof. Macoun, Canada, Pacific R.R. survey, west of the Saskatchewan, August, 1881. With all these differences I do not, however, feel warranted in giving either form a distinct name, since the general habit of the plants seems the same, namely, the short leaves and rays, the persistently three-celled and not attenuated terminals, the equally stipitate antheridia, similar sporangia and nuclei with varying striæ, in both sharp and slightly prominent. Other forms will doubtless be discovered which will enable us to group them with greater certainty.

In my plants the sporangia are numerous in the fundus of the verticil, both without and within the base of the leaves; but, on the fertile node of the leaf, they are regularly disposed on the ventral aspect, two, with the intermediate, rather long-stalked antheridium, while there are regularly three leaflets or rays on the dorsal aspect. The coronula is evanescent, and the ends of the enveloping cells of the sporangium are swollen (Plate Fig. 4). Mr. Pringle's plants have mature fruit in April (the usual time for *T. glomerata*), and Prof. Macoun's are in their prime in August. This fact, together with the much larger antheridia and rather smaller nuclei of the latter, with only six striæ, may prove sufficient to distinguish the forms as distinct sub-species. Further collections are needed.

TOLYPELLA COMOSA, *nov. sp.*—Minor, monoica, statura 0.05–0.10^m, color incrustatione cinerascens. Folia verticillorum sterilium indivisa, 3- articulata, fertilia in capitula congesta, simpliciter divisa, radiis 3- cellularibus, obtusis, non attenuatis. Sporangia in divisura foliorum et in fundo verticilli aggregata; coronula evanescente; nucleo atro, ovali $425\text{--}475\mu$ long., $320\text{--}360$ lat., 7-8- gyrato, striis prominulis, obtusis. Antheridia sessilia, $400\text{--}425\mu$ diam.

This plant is allied to the European *T. nidifica*, Leonh., from which it differs in its fresh water habit, smaller size, smaller antheridia and persistent coronula. It is thickly incrustated, having a greyish color even when first taken from the water, and is quite fragile. The fertile whorls are compact and compound, from numerous short axillary shoots. The leaves of the sterile verticils are simple, long, and have three segments. The fertile leaves have a short basal segment, then a fertile node consisting usually of three leaflets of unequal length, and three fruiting cells on the ventral aspect; these produce, usually, two sporangia and one intermediate antheridium, but occasionally we find two antheridia and one sporangium. The central cell is, however, always an antheridium, and the latter is sessile or nearly so. The lateral leaflets are longer than the dorsal leaflet; the terminal division of the leaf, above the fertile node, is elongated, $2\text{--}8^{\text{mm}}$, and three-celled. These numerous elongated leaflets clothe the plant as with hairs, hence the specific name *comosa*. The first segment of the leaflets is the longest, and the terminal segment usually the shortest. The diameter of the leaf, below the fertile node, averages 300μ (in *T. nidifica*, 400μ), of the terminal segment near the tip 100μ , (in *nidifica*, 190μ .) The main stem, below the first fertile verticil, averages 360μ in diameter. The primary verticil consists of seven leaves with some adventitious leaflets and sporangia, which

are usually developed from the cells of the basal leaf-node external to the verticil, though a few are seen within the whorl. The sporangia at the fundus of the verticil are comparatively few in this species.

This plant was gathered in company with *T. intertexta*, Allen, in Seneca Lake, N. Y., near Geneva, at a depth of about ten feet of water, in August, 1882.

Tolypella prolifera,* Leonh.—Plant large, clothed with broad and elongated green leaves, rarely incrusted. Sterile leaves simple, three to four-celled, elongated, acute. Fertile leaves with two (rarely three) fertile nodes and a three- to four-celled terminal, acute; rays of the leaf two to three at each node, 3-4-celled, mostly simple (fertile nodes have rarely been seen on the rays of the leaf in American plants), acute. The mucronate tip of the leaves and rays is somewhat elongated, never short and abrupt, from 100 to 120 μ long, and 45-50 μ broad at base; the leaf just below this tip is about 100 μ in diameter. Sporangia numerous in the fundus of the verticil and on the ventral aspect of the leaf-nodes; coronula persistent, superior cells longer than the inferior; nucleus chestnut-colored, round-oval, 345-375 μ (the largest fully mature) long, 300 μ broad; striæ 8-9, inconspicuous. Antheridia short-stipitate, 300 μ in diameter.

I am fortunate in possessing some of E. Hall's original specimens, determined by the late Prof. Braun, and have been able to compare other plants with this. Braun, in Nordstedt's "Fragmente," gives as localities: from Engelmann's herbarium, "Upper Missouri, Pinoin Springs, Hayden's survey, *Forma munda cinerascens*, 1858," and "Athens, Illinois, E. Hall." It has been sent to me by Prof. Macoun, "Flora of the great Plains, railway survey, Canada, near Bottsford, Aug. 6th, 1879." I have also received very young plants, having numerous, long, sterile leaves from the base, overtopping the whole plant, from Mr. Horsford of Vergennes, Vt., though there is some doubt as to their determination.

Doubtless the species will be found to be not uncommon in the northern portions of the country and in Canada.

TOLYPELLA FIMBRIATA, *nov. sp.*—Statura mediocris, 0.15-0.20^m alt., viridis. Folia verticillorum sterilium indivisa rarissime divisa, 2-3-articulata, acuta. Folia fertilia duplicato divisa, radiis fertilis 3-4-cellularibus. Sporangia in divisura foliorum et in fundo verticilli aggregata, coronula persistente, cellulis superioribus longioribus quam inferioribus; nucleo fusco, ovali, 425-450 μ long, 330-350 μ lat., oxygyro; striis 9-10, *prominulis, acutis*; antheridio stipitato, 300-335 μ diametro.

From *T. prolifera*, to which this species is most nearly allied, it differs in its smaller size, larger fruit, oval nuclei, with more numerous and prominent sharp angles.

The plant has a long, simple stem, naked (with perhaps one small verticil near the base) nearly to the compact head of fertile leaves. Just below this is usually the sterile verticil of 7-9 leaves, 0.05-0.08^m long, which extend far beyond the fertile head, forming a coarse fringe or involucre of leaves. Very rarely, the sterile leaves are divided, I have seen but one specimen divided:

* Description taken from American specimens. No satisfactory description of the species has as yet been given.

T. Californica, A. Br.—The following is taken from Braun's "Fragmente," edited by Norstedt, 1883.

"Color, a fine dark green, without incrustation. Habit somewhat similar to *T. nidifica*, but with more numerous verticils and heads, one above another; nothing of the long lower leaves could be seen in the fragments. The number of leaves, whether the lower were simple and whether there were sporangia in the fundus of the verticils, must be determined by better specimens. Terminal cell 0.10–0.12^{mm}. long, about 0.05^{mm}. broad. An antheridium which had fallen off measured 0.44^{mm}. in diameter, but further measurements are needed. Sporangia almost globular; nucleus dark brown, but transparent, with 8–9 visible "windings" (on one side), *smooth*, 0.38^{mm}. long, 0.32^{mm}. broad. Very nearly related to *T. nidifica*, but distinguished by its sharp tips; from *T. apiculata*, separated by its smaller sporangia with fewer windings, and by its general appearance; also distinct from *T. longicoma* by its many-celled segments and sharp tips, as well as by the shortness of the ultimate cells.—North America, Maria County, California, under willows, in slow-flowing streams. H. Bolander, Mar. 27th, 1865, comm. Dr. Engelmann, Aug. 1869."

I have received specimens from Dr. Engelmann from "Marion Co., Cal., H. Bolander, April, 1863," and have also examined very fine and perfect specimens in Prof. Gray's Herbarium at Cambridge, from "Swamps near San Rafael, Marion Co., Cal.," and am able to supplement Prof. Braun's description as follows:

Plant 0.10^m, becoming much branched (bushy): the fertile verticils on elongated peduncles, not crowded into dense masses; stems grass-green, conferva-like, about 600 μ in diameter. Sterile nodes two to four, of 12–15 leaves; of these, 6–8 seem to be normal and the others shorter and adventitious. Leaves about 360 μ in diameter, once divided into four leaflets, which are 4–6- or 7-celled; the adventitious leaves (intermediate in the verticil and not in the normal series), are usually shorter and not divided. The measurements of the leaflets gave the following diameters: first segment 285, second 240, third 210, fourth 150, fifth 135, sixth (or mucro) 50 broad and 170 μ long. The articulations are some what constricted and the walls thin and diaphanous. The fertile verticils are densely crowded with leaves and fruit, the internodes being very short (as in other *Tolypellæ*). The fertile leaf has usually two fertile nodes, each bearing three fruiting-cells (one antheridium and two sporangia) on its ventral aspect and three leaflets or rays on its dorsal. The rays and longer terminal leaflet are 4–6-celled. Sporangia nearly globular, *coronula persistent*, the ultimate cells somewhat elongated. Nucleus brown, with 8–9 striæ, which are not prominent, varying from 285–335 μ long and 300–320 μ broad. Antheridium rather long-stalked, 240–265 μ in diameter (I saw none so large as those Prof. Braun speaks of). Sporangia in the fundus of the verticil, but not as numerous as in some other species.

T. STIPITATA, *nov. sp.*—Statura 0.10–0.15^m. alt. Color viridis. Folia verticillorum sterilium divisa, ter-articulata, acuta. Folia fertilia divisa, nodis fructificationem gerentibus duobus, radiis indivisis 3-cellularibus acutis. Capitula fertilia laxa. Sporangia in divisura foliorum et in fundo verticilli aggregata numerosissima, longe stipi-

tata; coronula persistente, cellulis non elongatis; nucleo fusco, 335μ longo and 260μ lat., 7-8-striato, striis acutis, sub-prominulis. Antheridio $275-300\mu$ diametro, longe stipitato.

This interesting species appears to be intermediate between *T. Californica* and *T. intricata*. From the former it differs in the fewer segments of the terminals, and from the latter in the simple rays and smaller sporangia and antheridia. It has a loose habit of growth, the fertile verticils having comparatively long peduncles, not crowded into so dense heads as in other species. The fundus of the verticils is crowded with sporangia and antheridia on long stipes, which seem to take the place of leaves. There are but few leaves, generally four, to each verticil, with two shoots of new verticils (as shown in Plate). The peduncle of the fertile head measures 2.40^{mm} from the verticil to the first fertile whorl, 2.40^{mm} to second whorl, 1.50^{mm} to third 1.20^{mm} to fourth, showing the looseness of the compound fertile head. In *Tolypellæ* generally, the separation of the verticils of the fertile heads is very slight, so that a compact mass is formed.

I have received but one specimen of this species, collected by Mr. T. S. Brandegee, in a pond near Mt. Carbon, Elk Range, and forwarded to me by Mr. John H. Redfield of Philadelphia.

T. intricata, Leonh.—Monœcious. Robust, $0.20-0.40^{\text{m}}$ high; growing in mossy bunches; light green, in age becoming greyish or brown with incrustation, and brittle. Stem much branched from the base up. Lower verticils long-leaved, spreading; the upper shorter, compacted into a thick head (nest-like). Verticils composed of 6-7 large leaves, with as many more small (accessory) ones. Sterile leaves once divided, the fertile ones mostly twice divided. Fertile leaves with 2-3 nodes producing leaflets; leaflets of unequal length, 4-5-celled, those of the first leaf-node divided, fertile, attenuated to the tip, the terminal cell short and acute. Sporangia on the nodes of the leaves and rays, and very numerous in the fundus of the verticil. Coronula persistent; nucleus light brown, oval, with 10-11, prominent angles. Antheridia $320-350\mu$ in diameter.

This species germinates in the fall and fruits in the following spring, ripening by the end of April or in May, and quite dying down and disappearing by the beginning of June (in Europe).

I have received one specimen of this species from Canada (a typical form), and it is to be expected from various parts of the country.

T. INTERTEXTA, nov. sp.—Statura robustior, $0.4-0.5^{\text{m}}$ alt., color incrustatione demum cinerascens. Verticillis inferioribus remotis, foliis sterilibus 8, $60-80^{\text{mm}}$ long., divis; terminalibus 4-cellularibus, acutis. Folia fertilia duplicato (vel rarius triplicato) divisa, nodis fructificationem gerentibus duobus; radiis divis, fertilibus 4-cellularibus (rarius 3-5), acutis, mucrone 85μ long., $55-65\mu$ lat. Sporangia in fundo verticilli et in divisura foliorum aggregata, coronula elongata, sub-persistente; nucleo ovali, $450-475\mu$ long., fusco, rogyrato, striis acutis, sub-prominulis. Antheridia brevi-stipitata, $320-350\mu$ diametro.

This large and handsome *Tolypella* differs from its allied species, *T. intricata*, by its habit, its large sporangia, its peculiar coronula and

the time of fruiting (fall). The leaves are abruptly pointed with a short and stout mucro. The sporangia are numerous, often double from a single cell (as in Plate XLII., Fig. 3). The coronula is peculiar in its oblique direction and sub-persistent character, and becomes detached when the sporangium is quite old. The dense interweaving of the divisions of the leaves surrounding the fertile heads suggests the specific name.

Gathered from deep water (10-15 ft.) in Cayuga Lake, N. Y., August, 1882. I have also received a fragment from Canada, collected by Miss Cary, and sent by A. L. Kemp, LL.D.

EXPLANATION OF PLATE XXXVII.—Fig. 1. Plant, natural size from Arizona. Fig. 2. Sketch of the base of a verticil showing the simple, sterile leaves, not longer than the compact fruiting verticils, which are incompletely outlined. Fig. 3. A portion of the stem, showing two crowded fertile whorls with numerous sporangia at the base of the leaves. Fig. 4. A mature sporangium. Fig. 5. A mature nucleus. Fig. 6. A tip of a leaf. (Figures 2 to 5 are from the Arizona plant, and Figures 7 and 8 from the dwarf Canada plants). Fig. 7. A node of a leaf, the antheridium having fallen. Fig. 8. A sporangium prior to the falling of the coronula.

EXPLANATION OF PLATE XXXVIII.—Fig. 1. Plant, natural size. Fig. 2. A fertile node magnified 25 diameters, showing the fertile cells all on the ventral aspect, usually with two sporangia and one antheridium. In some places the fruit has been rubbed off in preparing the specimen for the camera. Fig. 3. A fertile node of a leaf, ventral aspect, showing two antheridia and one sporangium. Fig. 4. Dorsal aspect of a fertile node, showing three unequal, 3-celled leaflets. In all these figures space does not permit the delineation of the long terminals of the leaves. Fig. 5. The apex of a sporangium, showing the evanescent coronula, magnified 200 diameters. Fig. 6. A mature nucleus with eight prominent, blunt angles, magnified 50 diameters.

EXPLANATION OF PLATE XXXIX.—Fig. 1. Plant natural size. Fig. 2. A portion of a fertile verticil, with two nodes of a leaf and two fertile rays on the lower node, magnified 25 diameters. Fig. 3. A fertile leaf-node showing the stipes of two antheridia, which have fallen, magnified fifty diameters. In this species we frequently find two antheridia (central) and two sporangia (lateral) on the ventral aspect of a leaf; in which case there are usually but two rays on the dorsum of the leaf. Fig. 4. The coronula magnified 200 diameters. Fig. 5. A mature nucleus magnified 200 diameters. Fig. 7. Tip of leaf.

EXPLANATION OF PLATE XL.—Fig. 1. Plant, natural size (fresh specimens will modify this sketch). Fig. 2. A leaf magnified 25 diameters, showing the undivided sterile rays. Fig. 3. The tip of a sporangium, showing the persistent coronula x 200 diameters. Fig. 4. A mature nucleus, magnified 50 diameters. Fig. 5. The node of a sterile leaf, showing its division into 4 leaflets x 25 diameters. Fig. 6. The tip of a leaflet magnified 50 diameters.

EXPLANATION OF PLATE XLI.—Plant, natural size, with the fertile heads on one branch at A, the other heads having been removed (as at B) to show the arrangement of the sterile leaves. Near the bottom of the stem there is a small verticil of sterile leaves. Fig. 2. A fertile shoot, taken at A in Fig. 1, magnified 5 times to show the general form. All the sterile leaves have been removed, except from the lowest fertile verticil. Usually there are four sterile leaves, each divided into four leaflets, and two shoots bearing new fertile verticils from each verticil. Some of the normally sterile leaves of the upper verticils become fertile. There are usually 5-6 successive series of fertile verticils, the uppermost bearing fruit in the verticil, and about six fertile leaves (magnified 5 diameters). Fig. 3. A fertile verticil with numerous, long-stipitate fruits, showing at B, the basal node of a leaf that has been removed; magnified 40 diameters. Fig. 4. The dorsal aspect of a fertile ray x 40. Fig. 5. The ventral aspect of a node of a fertile ray (the antheridium removed), magnified 25 diameters. Fig. 6. The apex of a ray, showing the long slender point, magnified 200 diameters. Fig. 7. The coronula of a sporangium magnified 200 diameters. Fig. 8. A mature nucleus magnified 50 diameters.

EXPLANATION OF PLATE XLII.—Fig. 1. Plant natural size, showing only the upper portion. Fig. 2. A portion of a leaf, showing two fertile nodes, and fertile rays from the lower node, magnified 25 diameters. Fig. 3. Another leaf, showing two twin sporangia, each pair from one cell (divided horizontally). Figs. 4 and 5. Tips of leaves, magnified 200 diameters. Fig. 6. The elongated oblique coronula. Fig. 7. Top of an old sporangium after the coronula has become detached. Fig. 8. The nucleus magnified 50 diameters.

New Species of Fungi.

By J. B. ELLIS and BENJAMIN M. EVERHART.

SPHÆRELLA (LÆSTADIA) POLYSTIGMA.—Perithecia large, scattered thickly over the lower surface of the leaf, covered by the blackened cuticle, subhemispherical, collapsing; ostiolum papilliform, at length perforated; asci $35-40 \times 8 \mu$, oblong, sessile; sporidia biseriate, ovate-elliptical, continuous, subhyaline, $10-12 \times 3-4 \mu$, in shape very much like apple-seeds.

Allied to *S. carpineæ*. On fallen oak-leaves. Ohio. Kellermann.

SPHÆRELLA PANDURATA.—Hypophyllous; perithecia globose ($.17-.25^{\text{mm}}$), buried in the substance of the leaf, and, except the slightly projecting, rounded apex, covered by the blackened cuticle; ostiolum papilliform, minute; asci oblong-cylindrical, $50 \times 7 \mu$; sporidia biseriate, fusiform, 4-nucleate, yellowish, constricted in the middle and bulging out each side of the constriction, $10-12 \times 3 \mu$.

On fallen oak-leaves. Plainfield, N. J., September, 1883. G. F. Meschutt.

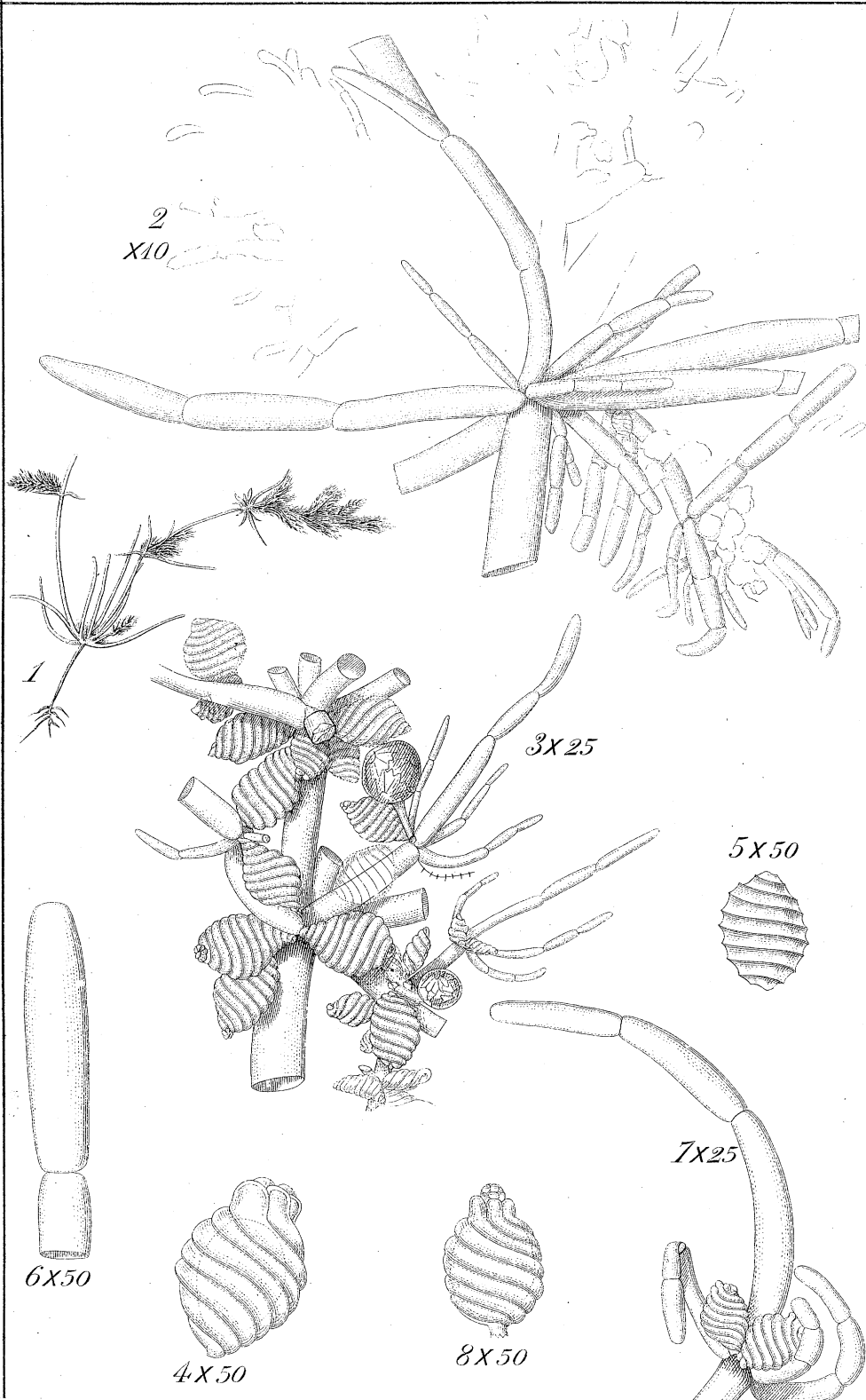
MELANCONIS EVERHARTII, Ellis.—Perithecia globose ($.25^{\text{mm}}$) in compact clusters of 4-18, just under the outer layer of the inner bark, which is raised into little tubercles about 1^{mm} in diameter, from which arise, in a compact fascicle, piercing the epidermis, the short-cylindrical, obtuse ostiola, their tips perforated with a rather large circular opening; asci clavate-cylindrical, $114-120 \times 19 \mu$; paraphyses stout, sparingly septate and granular; sporidia biseriate, oblong-elliptical, uniseptate, nearly hyaline $34-38 \times 11 \mu$.

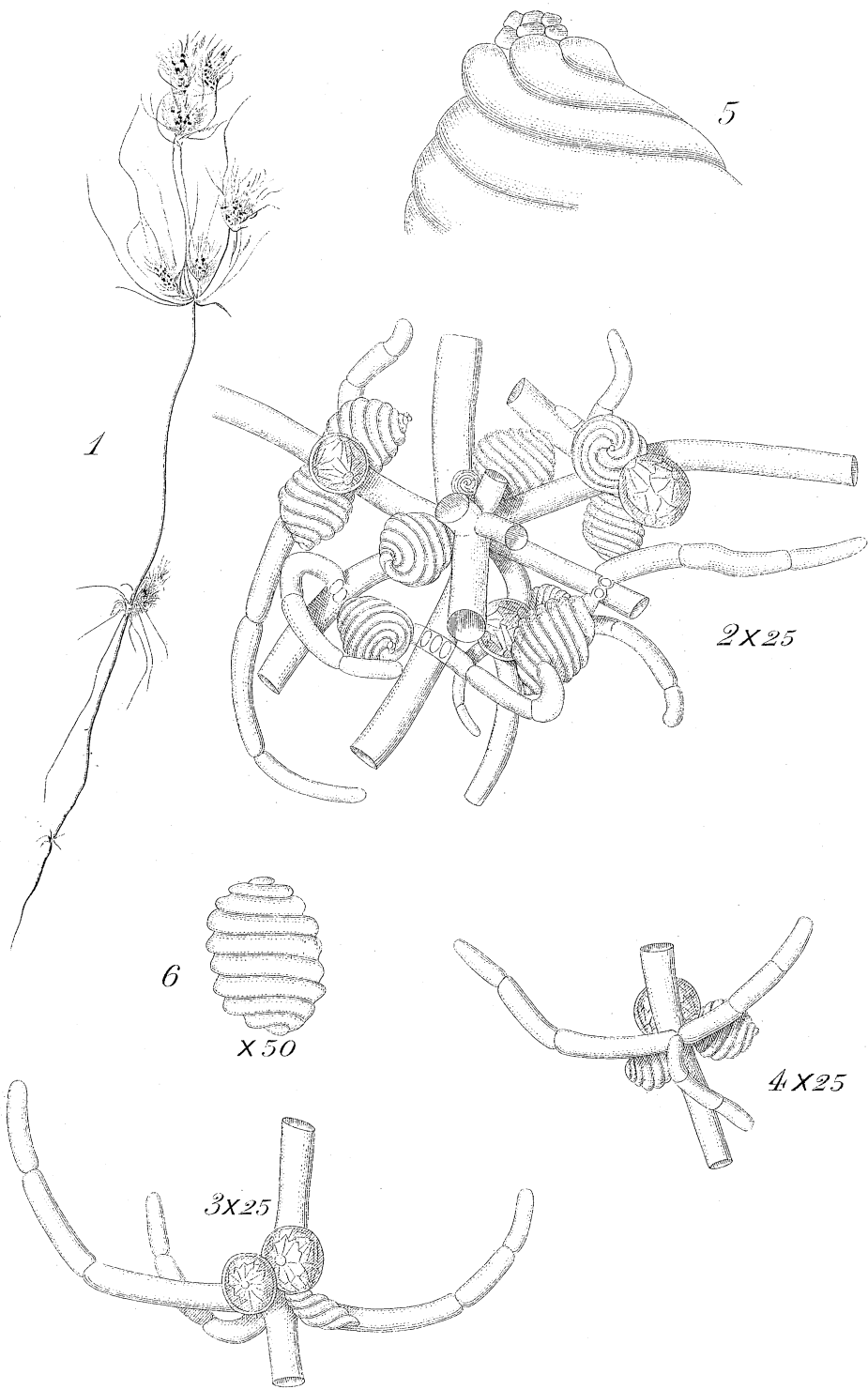
On a fallen sapling of maple. West Chester, Pa., June, 1882.

The ostiola throw off the epidermis, and the perithecia themselves soon after fall out, leaving light colored, circular spots which mark the place of their attachment. The fruit is almost exactly that of *M. Modonia*, Tul., but the more elongated ostiola, the smaller perithecia and deciduous habit distinguish it.

MELANCONIS (MELANCONIELLA) MESCHUTTH.—Perithecia $10-20$ ($.25 \times .33^{\text{mm}}$), circinating in a thin, lenticular, black, orbicular or elliptical stroma seated on the surface of the inner bark; ostiola short cylindrical, united in a dirty brown disk bursting through transverse cracks in the epidermis, their tips, in well developed specimens, distinctly 4-cleft; asci (spore-bearing part) about $75 \times 10 \mu$; sporidia biseriate, elliptical, very slightly curved, uniseptate and slightly constricted, subhyaline at first, with a faint, transparent, horn-shaped appendage at each end, but these soon becoming absorbed and the spore becoming brown, $14-16 \times 6-8 \mu$ (mostly $15-16 \times 6 \mu$.)

On dead limbs of birch. Plainfield, N. J., June, 1883. George F. Meschutt. *Gelatinosporium betulinum*, Pk., occurs on the same branches, and where the epidermis is weaker, the appearance of the





T. prolifica Leont.

